depth as the pseudo buried layers **202** to connect the two pseudo buried layers **202** to form the buried layer for the collector region **214**.

The n type ion implantation impurity of the collector region **214** is phosphorous with a dosage of 1e12~1e14 cm^{-2}. The implantation is carried out to the whole SiGe HBT after the removal of the third layer of the hard mask. The deep trench contacts **204** for the collector region **214** are formed by filling the deep trench with titanium and titanium nitride transition metal and metal tungsten. The ohmic contact of the collector region **214** can be directly formed by the metal deep trench contacts **204** and the pseudo buried layers **202**, or a self-aligned n type ion impurity implantation can be carried out after deep trench etch to form better ohmic contact to the collector electrodes. Metal deposition can adopt PVD or CVD; the thicknesses of titanium and titanium nitride are respectively 100 Å~500 Å and 50 Å~500 Å. The depth of the deep trench **204** is determined by the depth of the shallow trench **203** plus the thickness of the inter-layer dielectric **205** between the metal layer **207** and the substrate **201**.

When defining the base window, two materials with largely different etch rates are adopted in order to protect the interface between the collector region **214** and the base region **211**. The first layer **213** is silicon oxide, the second layer **208** is polysilicon or silicon nitride, the thickness of the first layer **213** is 100 Å~500 Å, the thickness of the second layer **208** is 200 Å~1000 Å. When opening the base window by lithography, the second thin film layer **208** is etched first, and stops on the first thin film layer **213** that is almost intact, then n type impurity ion implantation to collector region **214** is carried out with the photo resist on.

Compared with the existing active region diffusion collector pick up **104**, the deep trench contact **204** of the present invention saves huge area. At the same time, as the collector pick up is inside the shallow trench field oxide **203**, no large collector capacitance will exist. Therefore, when adopting multi-finger structure to increase the current driving capability, the number of the collectors can be increased, so that in one aspect the distance of the current path is reduced, and in another aspect the collector electrode current density is decreased, thus reducing the device area.

While the invention has been particularly shown and described with reference to the preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made without departing from the spirit of the invention or from the scope of the appended claims.

What is claimed is:

1. A SiGe heterojunction bipolar transistor (HBT) multi-finger structure, consisting of a plurality of SiGe HBT single cells; the multi-finger structure being expressed as C/BEBC/BEBC/.../C, wherein C, B and E respectively represents a collector, a base and an emitter of a SiGe HBT, and CBEBC represents a SiGe HBT single cell, two neighboring SiGe HBT single cells sharing a same collector; an active region of a SiGe HBT single cell being isolated by field oxide shallow trenches, wherein a SiGe HBT single cell comprises:

a collector region, consisting of an n type ion impurity implanted layer formed in the active region, the bottom of the collector region being connected to a buried layer formed by two n type pseudo buried layers at both sides of the active region, the collector region being connected to two collectors through the two n type pseudo buried layers and two deep trench contacts formed in the field oxide above the n type pseudo buried layers;

a base region, consisting of a p type SiGe epitaxial layer formed on top of the collector region, the base region being connected to two bases through two polysilicon layers at both sides of the base region and two metal contacts formed on the polysilicon layers; and

an emitter region, consisting of an n type polysilicon layer formed on top of the base region, the emitter region being connected to an emitter through a metal contact formed on top of the emitter region.

2. The SiGe HBT multi-finger structure as claimed in claim **1**, wherein, the n type ion impurity is phosphorus, and the dosage is 5e12~1e14 cm^{-2}.

3. The SiGe HBT multi-finger structure as claimed in claim **1**, wherein, the n type pseudo buried layers are formed by n type ion impurity implantation; the n type ion impurity is phosphorus.

4. The SiGe HBT multi-finger structure as claimed in claim **3**, wherein, the dosage of the n type ion impurity implantation is 1e14~1e16 cm^{-2}, and the energy is 2~50 KeV.

5. The SiGe HBT multi-finger structure as claimed in claim **3**, wherein, during the implantation of the pseudo buried layers, the top of the active region is protected by a hard mask, and the sidewalls of the active region are protected by sidewall spacers to prevent ion impurity from implanting into the active region.

6. The SiGe HBT multi-finger structure as claimed in claim **5**, wherein, the hard mask is consisted of three dielectric layers, which are from the bottom up a silicon oxide layer, a silicon nitride layer, and a silicon oxide layer.

7. The SiGe HBT multi-finger structure as claimed in claim **6**, wherein, the thicknesses of the three dielectric layers from the bottom up are respectively in the ranges of 100 Å~300 Å, 200 Å~500 Å, and 300 Å~800 Å, the thicknesses being determined by the energy of the n type ion impurity implantation.

8. The SiGe HBT multi-finger structure as claimed in claim **5**, wherein, the thickness of the sidewall spacers is in a range of 300 Å~1000 Å, being determined by the energy of the n type ion impurity implantation.

9. The SiGe HBT multi-finger structure as claimed in claim **6**, wherein, the collector region is formed by n type ion impurity implantation to the entire SiGe HBT region after removing of the top silicon oxide layer of the hard mask.

10. The SiGe HBT multi-finger structure as claimed in claim **1**, wherein, the two pseudo buried layers are interconnected inside the active region through lateral diffusion to form the buried layer.

11. The SiGe HBT multi-finger structure as claimed in claim **1**, wherein, the two pseudo buried layers are interconnected to form the buried layer by implanting the same type of ion impurity as of the pseudo buried layers into the active region at the same depth as of the pseudo buried layers.

12. The SiGe HBT multi-finger structure as claimed in claim **1**, wherein, the deep trench contact of the collector is formed by filling the deep trench with titanium and titanium nitride transitional metal and metal tungsten.

13. The SiGe HBT multi-finger structure as claimed in claim **12**, wherein, the thicknesses of the titanium and the titanium nitride are respectively in a ranged of 100 Å~500 Å and 50 Å~500 Å.

14. The SiGe HBT multi-finger structure as claimed in claim **1**, wherein, an ohmic contact of the collector is formed directly by the deep trench contact and the pseudo buried layer connected thereto.

15. The SiGe HBT multi-finger structure as claimed in claim **1**, wherein, an ohmic contact of the collector is formed by n type impurity self-aligned implantation to the bottom of the deep trench contact after the deep trench is etched.

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